

APPENDIX 30 B. Definitions of the Metrics used by U21 and QS in Table 30.4

Expanded Metrics used by Universitas 21 2017

<http://www.universitas21.com/article/projects/details/158/overall-2016-raning-scoresr> -

U 21 CATEGORIES – definitions and data sources

R - Research [expenditures] 20%

E – Environment – 20 %

C – Connectivity – 20%

O –Output – 40%

Research

R1: (5%) Government expenditure on tertiary education institutions as a percentage of GDP, 2013. (OECD Education at a Glance 2016 Table B2.3 & UNESCO Institute for Statistics [UIS p UNESCO Institute of Statistics] www.uis.unesco.org)

R2: (5%) Total expenditure on tertiary education institutions as a percentage of GDP, 2013. (Same as R1)

R3: (5%) Annual expenditure per student (full-time equivalent) by tertiary education institutions in USD purchasing power parity, 2013. (OECD Education at a Glance, 2016 Table B1.1a; UNESCO UIS; IMF data and statistics *

R4: (2.5%) Expenditure in tertiary education institutions for research and development as a percentage of GDP, 2014. UNESCO, UIS; IMF, data and statistics

R5: (2.5%) Expenditure in tertiary education institutions for research and development per head of population at USD purchasing power parity, 2014. (Same as R4)

The highest ranked countries for resources are Sweden Denmark, Canada, Singapore, Switzerland and the USA. Resources per student, including research expenditure are highest in Singapore, the USA, Hong Kong and the UK.

Environment

E1: (1%) Proportion of female students in tertiary education, 2014. (UNESCO UIS)

E2: (2%) Proportion of academic staff who are female in tertiary institutions, 2014. (Same as E1)

E3: (2%) A rating for data quality. For each quantitative series, the value is 2 if the data are available for the exact definition of the variable; 1 if some data are available which relate to the variable but some informed adjustment is required; and 0 otherwise.

E4: (10%) Qualitative measure of the policy environment comprising (OECD *Education at a Glance* 2016

E4.1: (2%) a measure of diversity of the system; an index including the mix of public and private institutions and percentage of students in short-term tertiary education (ISCED level 5)

E4.2: (4%) survey results for the policy and regulatory environment

E4.3:(4%) survey results for financial autonomy of public universities

E5: (5%) Responses to WEF survey question (7-point scale): “how well does the educational system in your country meet the needs of a competitive economy?” (World Economic Forum, Global Competitiveness Report 201-2017; Table 5.03)

The top-ranked countries in the Environment module are the United States, New Zealand, Australia, Singapore, the UK and Hong Kong SAR. Hong Kong is also in the top three for E4, the qualitative measures.

Connectivity

C1: (4%) Proportion of international students in tertiary education, 2014. (OECD *Education at a Glance* 2016 TABLE C4:1 UNESCO

C2: (4%) Proportion of articles co-authored with international collaborators, 2014 (all institutions that publish at least 100 papers). (Scimago using data from Scopus)

C3: (2%) Webometrics Web TRANSPARENCY measure - sum of values from 4,200 universities divided by country's population (July 2015 ed.)

C4: (2%) Webometrics VISIBILITY index - external links that university web domains receive from third parties – sum of data from 10,000 tertiary institutions divided by country's population, (same as C3)

C5: (4%) Responses to question ‘Knowledge transfer is highly developed between companies and universities’, asked of business executives in the annual survey by IMD World Development Centre, Switzerland, (IMD World Competitiveness Report 2016 Table 4.3:2.3)

C6: (4%) Percentage of university research publications that are co-authored with industry researchers, 2012-14. (R Tijssen and R Yegros-Yegros, CWTS Leiden)

The median percentage is 43.7% with Hong Kong second at 66% and Singapore fifth at 59%. Singapore, New Zealand, Australia and the U.K. have the highest number of international student.

Output

O1: (10%) Total articles produced by higher education institutions, 2014. (Scimago data, Scopus databank www.scimagoir.com)

O2: (3%) Total articles produced by higher education institutions per head of population, 2014. (Same as O1)

O3: (5%) Average impact of articles as measured by citations in 2014 to articles published in previous years using the Karolinska Institute normalized impact factor. (Same as O1)

O4: (3%) The depth of world class universities in a country. This is calculated as a weighted average of the number of institutions listed in the top 500 according to the 2016 Shanghai Jiao Tong scores, divided by country population. (ARWU 2016 www.shanghairanking.com)

O5: (7%) The excellence of a nation's best universities calculated by averaging the 2016 Shanghai Jiao Tong scores for the nation's three best universities. (Same as O4)

O6: (3%) Enrolments in tertiary education as a percentage of the eligible population, defined as the five-year age group following on from secondary education, 2014. (UNESCO UIS)

O7: (3%) Percentage of the population aged 25–64 with a tertiary qualification, 2015.

(OECD *Education at a Glance* 2016; Table A1.2; UIS; ILOSTAT database www.ilo.org;

O8: (3%) Number of researchers (full-time equivalent) in the nation per head of population, 2014. (UIS)

O9: (3%) Unemployment rates among tertiary educated aged 25–64 years compared with unemployment rates for those with only upper secondary or post-secondary non-tertiary education, 2015. (OECD *Education at a Glance*, 2016, Table 5.4 and ILOSTAT data base

Top countries for research impact, with slight difference in scores include Singapore, the USA and the UK. Singapore, New Zealand, Australia and the UK have the highest proportion of international students.

Additional information In Appendix 1 of [U21 Ranking of national higher education systems](#)

REFERENCE:

Yegros-Yegros, A. and Tijen, R. (3-5 September 2014). University-Industry dual appointments: global trends and their role in the interaction with industry in E. Noyons, (Ed.), in *Context Counts: Pathways to master big and little data*. Paper presented at STI2014 Leiden University, Leiden (724-742) Universities Leiden - CWTS: Leiden

QS' indicators using QS descriptions.

System strength – Assessment of overall national system strength.

Score is based on the number of its institutions ranked 700 or above in the QS World University Rankings®, divided by the average position of those institutions. The aim is to give an overall indication of each country's standing in the global ranking tables

Access - Places available to world-class higher education.

Score calculation is the total number of full-time equivalent students at universities in the top 500 of the QS World University Rankings, divided by the square root of the population. The aim is to give an indication of the chances of gaining a place at a world-class university for residents of the country in question.

Flagship institution –

Score is a normalized score, based on the place each nation's top university occupies in the QS World University Rankings. This indicator is based on the premise that the performance of a

country's leading institution is a credit to the overall system, often resulting from national investment in developing a flagship institution to lead the way.

Economic context -

Score compares each nation's financial situation to its performance in the international rankings. An indexed score is awarded for each university featured in the rankings (7 points for a university in the top 100, 6 points for 101-200, 5 points for 201-300, 4 for 301-400, 3 for 401-500, 2 for 501-600 and 1 for 601-700), and this is then factored **against the GDP per capita for the country**

QS methodology <https://www.topuniversities.com/system-strength-rankings/methodology>